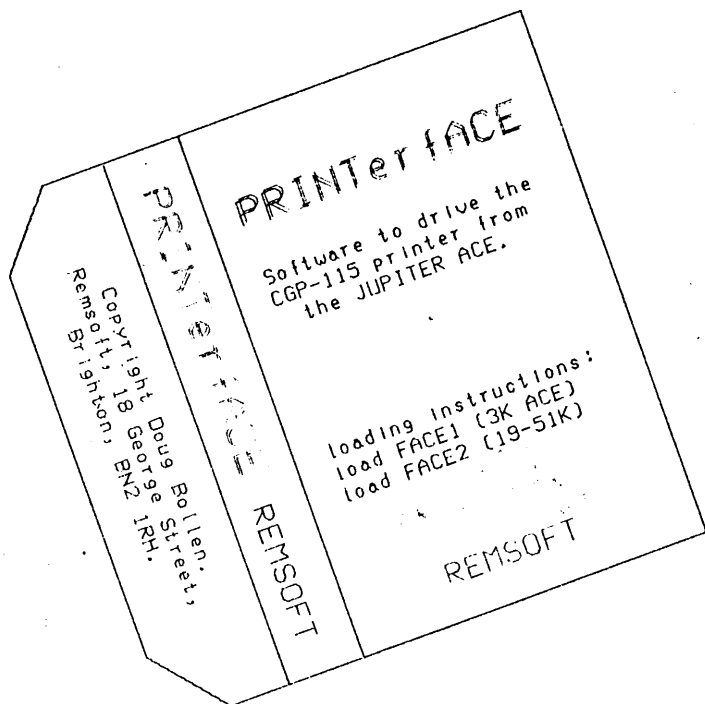


# ACE USER

NEWSLETTER OF THE JUPITER ACE USERS CLUB

no. 3: 1983



At last, no.3 appears. And about time too, I hear you mutter! I had hoped that both financially and textually(?) we could have four newsletters this year. However, membership is about 250, advertising has cost more than expected, and there's only just enough material on hand for this issue. To complicate matters, Doug Bollen has decided to leave Remsoft and concentrate on hardware and technical writing. So now Remsoft is me, a marketing bloke with a publishing background, and a smattering of software expertise.

However, looking on the bright side, we do have some excellent material in this issue. We also have a very high quality range of software. You've been getting to know your Aces! Tapes 11-18 are listed on page 30, plus later tapes on p31 as a stop press, just before going to the printers. Before he left, Doug looked at incoming tapes, and indicated what should be tapes 19-30. I'm also negotiating licensing agreements for several overseas markets, so software authors may yet strike their jackpot.

Hardware wise, the Ace looks set to acquire some long-awaited add-ons by the end of this year. Essex Microelectronics are getting their range under way (see their advert in this issue), and Innovonics are entering the field too. There's a new joystick just emerging from Cambridge, with supporting software, though a trifle expensive. Doug's first hardware project is a plug-in keyboard/joystick interface which needs no software (joystick can access any group of five keys) - about £15 excluding keyboard and joystick. We hope to make this available to club members. Ace rumours are dealt with on page 14.

Also, of course, Remsoft is involved in the designing of a new 128K 6502 FORTH computer with decent keyboard, and range of interfaces, plus DOS on board for the Sony 3½ inch microfloppys (sold separately). Oh yes, its got 8 colours, and high-res graphics. Prototypes are being built now, in August, and launch is Oct/Nov. About £400 target price. Microwhatsits about £150-200. Thanks to those who completed the questionnaire. Very helpful. More details next issue.

Finally a plea to authors - PLEASE send things typed, preferably single-spaced, on A4 with wide margins, and use a new ribbon in your typewriter please. Those with printers, please use 'em! No rambling hand written missives please. Aint got the time to decipher and retype. Also no Doug to transcribe badly scrawled FORTH listings either. A tenner's worth of software for articles is still paid (please indicate titles when writing).

The National Jupiter Ace Users Club. Annual subscription £7 pa. Members get 3 issues of Ace User per year, plus a discount of £1 per tape on software, plus special offers on hardware. SAE for details. Cheques payable 'Remsoft' please.

ACE USER is published by REMSOFT, 18 George Street, Brighton, BN2 1RH, E.Sussex, United Kingdom. Tel. 0273-602354.

For those who want the advantages of a full size keyboard I am writing up the details of how I wired up my own. It is only recommended that you do this if you have some electronic soldering experience as it involves connections to the Ace circuit board itself and will void your warranty if it goes faulty through misconnections or solder blobs in the wrong places.

I have used the Fuller keyboard which was designed for the ZX81 and modified the printed circuit board with cutting the strips and some additional wires. The method used should be easily adaptable to other brands and sufficient data is provided here to make that possible.

The attached fig. 1 shows the Jupiter Ace keyboard matrix. In wiring up my own board I found that the computer would crash occasionally and produce some peculiar reactions unless the 5 10K pull-up resistors were added to the 74LS367 keyboard buffer. These are shown in the diagram. The 40 keys are connected in a 5 x 8 matrix which is decoded in the Ace to give the correct response.

The essential difference in the ZX81 and Ace keyboard matrices is in the bottom row. As you can see in the diagram the 2 shift keys are adjacent in the matrix but on the keyboard they are opposite. This means that the copper strips running to those keys on the bottom row have to be rewired. (On the Fuller p.c.b. not the Ace one).

I have not drawn out the p.c.b. as the diagram would probably be more complicated than just comparing the board and key layouts.

If you take apart the Ace (push the inner part of the plugs inside the machine with a sharp pointed instrument then they come out easily) you can compare the key positions and follow these connection details. The 5 keyboard buffer wires connect to the Ace in the small holes connected to the keys 1 to 5. The correct connections are those coming from the right hand side of the meshed tracks. The 8 address lines connect to the following positions:

- A8 top of key X
- A9 small hole in the track connecting keys A through G
- A10 top of key E
- A11 hole in track connecting keys 1 to 5
- A12 a track runs connecting keys 6 to 0 over to a small hole right next to the one for A11
- A13 top of key Y
- A14 top of key H
- A15 there is a track connecting M,N and the space key that runs to a hole near the top of key V to which you can connect.

The 5v + bus runs just above keys 1 to 0 and is the thick track with 2 large holes in it. There are several small holes on it that you could connect to.

The 5 resistors can be wired onto a piece of veroboard and the 5 lines run from the replacement keyboard to that and from there together with a line for +5v to the Ace p.c.b.

To Data Bus 220

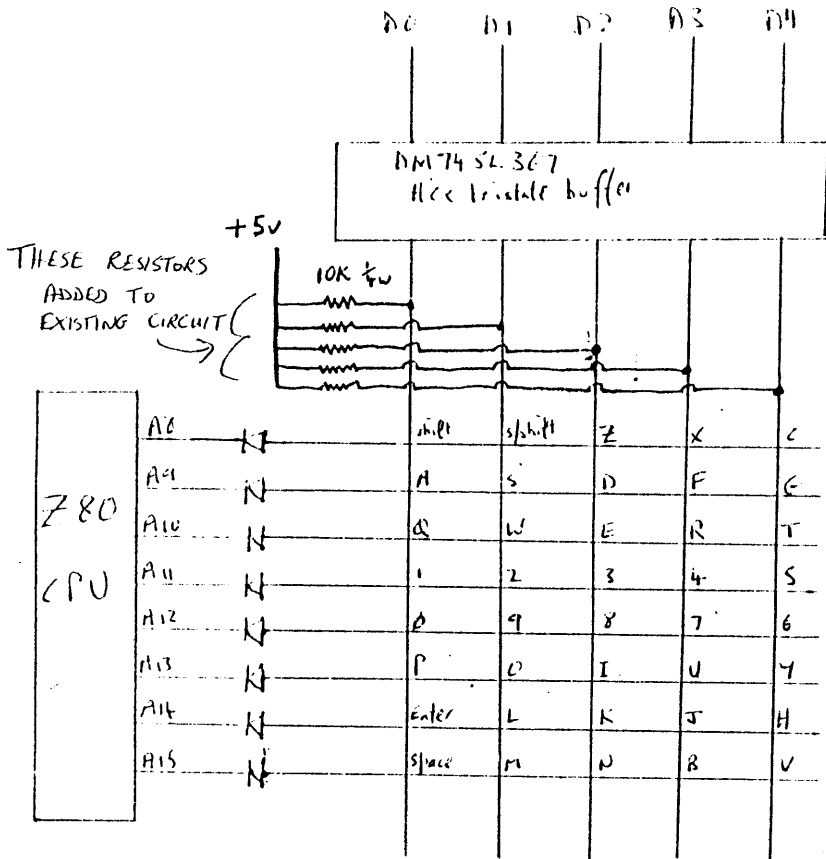
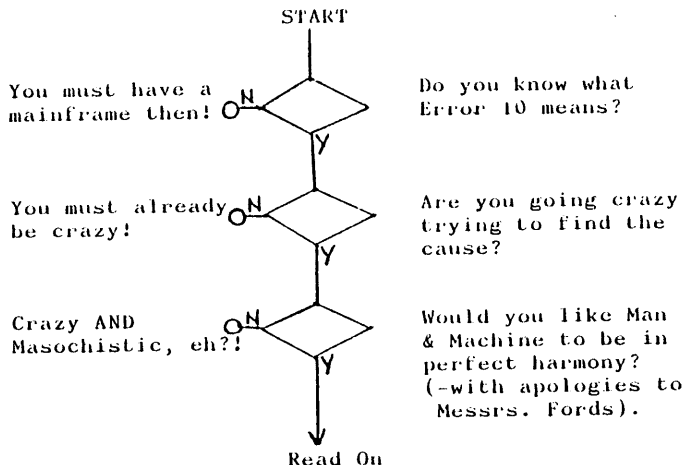


TABLE FOR USING IN FUNCTION FOR GETTING KEY PRESSED

IN	10	8	4	2	1
FEFE	C	X	Z	S/S	Shift
FDFF	G	F	D	S	A
FBFB	T	R	E	W	Q
77FF	5	4	3	2	1
EFEE	6	7	8	9	0
DFEE	Y	U	I	O	P
BFEE	H	J	K	L	Enter
77FF	V	B	N	M	



If you arrived at the bottom of this flow-chart then you may be interested in my experience.

I got my Ace last November and use it with a W.H. Smiths' CCR800 Computer Compatible Cassette Recorder. (£29-95). This is a good medium-priced recorder which if the rest of this article is followed will be found to give excellent results. It's biggest selling point in my opinion is that it works with both leads connected!

During the first 2 weeks of life with the Ace I was getting a tremendous amount of Error 10's. Trying 3 other tape recorders made no difference and by the time I had reached step two of the flow-chart I decided something had to be done.

Constant cleaning and de-magnetisation of the heads made no improvement but on further investigation it became apparent that the Error 10's always occurred when my wife was using the washing machine. As there are seven of us in the family this was a very frequent event! A quick trip downtown to the component stockist produced a 250v V.D.R. (45p). This is a Voltage Dependent Resistor whose resistance varies according to the voltage across it. Below 250v it has a very high resistance but when the voltage exceeds 250v it's resistance drops thereby shunting away any mains "spikes". Dash home again, switch off the mains supply (right in the middle of the football match!) connect the V.D.R. across the Live and Neutral terminals of the mains socket, switch on mains, plug-in the Ace, try it and - Voila! - success!

Bliss reigned supreme in the household until one day Remsoft released their first Ace software. This was promptly sent for only to find it produced the dreaded Error 10 again! House now filled with computing phrases such

as, "--!@\*?'&! Remsoft Can't produce !@\*?'&! Ace tapes!". To prove the above statements the tapes were passed to a friend who had just purchased an Ace and who promptly reported that they had loaded first time! When a tape he had recorded on his Ace wouldn't load on mine either I had to admit that just maybe, perhaps, possibly, there was still something wrong with my system!

This was, of course, the case and turned-out to be the head being misaligned. One tends not to suspect the heads on a brand-new machine but you must remember that the heads are aligned at the factory, then the machine is thrown into the back of a lorry for delivery to the wholesaler who throws it into his warehouse and then into another lorry for delivery to the retailer who throws it into the back of the shop until a fumble-fingered assistant drops it 3 or 4 times before selling it to you! In short anything can happen between the factory making it and you getting it! It's no use saying, "--well it's alright playing music" either. For computer use the tape must be exactly at right-angles to the head to achieve maximum output. This is not something that can be achieved visually either so my thanks to Messrs. Hilderbray, 8/10 Parkway, Regents Park, London NW1 7AA, who produce an excellent, easy-to-use head alignment tape with full instructions.

Now began another blissful period of perfect Loading - until - one day - (My God!, is there no end to this?) - whilst dissecting the Aces' innards, (never mind why!!) I managed to blow it up destroying 8 chips including the processor. This took me ten days and a considerable number of pennies to rectify. Upon completion everything worked again except that tape loading had now become a 50/50 affair!

Out came the 'scope yet again to find that the signal at point A of the loading circuit (shown in fig. 1) which should be a nice clean square-wave, looked like that shown in fig. 2, i.e. lots of noise on the leading edges of the square-wave. Changing the capacitor for another of the same value produced a slight improvement so I decided to experiment. Finally, fitting a .1uF polycarbonate capacitor produced two results:-

- a) an increase in voltage level from 3.9v to 4.6v and
- b) a beautifully clean square-wave.

I have now had Error 10-free operation for weeks and can even load a tape which had always given trouble because it was an old cheap and very tatty tape!

To summarise, if you want error-free loading I would suggest the following:-

- 1) Check for and eliminate local interference. Try a V.D.K. If that doesn't work then you will have to buy a more expensive Mains Filter Unit.

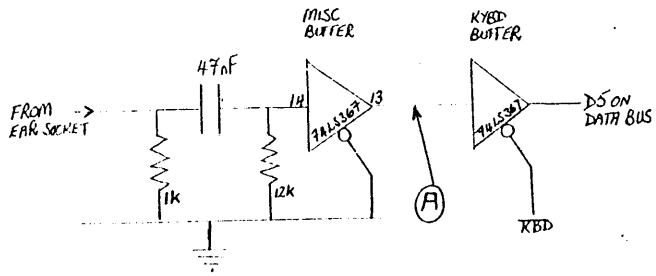


fig.1. TAPE LOAD CIRCUIT

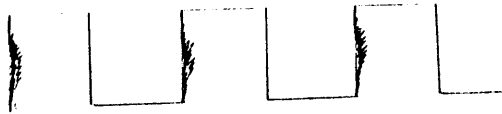


fig.2. BAD SIGNAL AT POINT A.

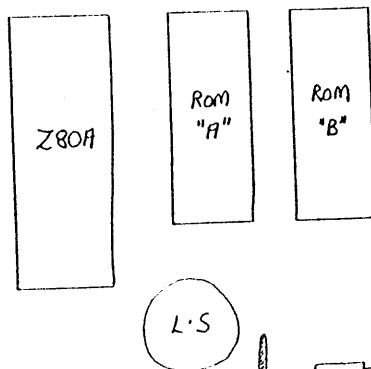


fig.3. LOCATION OF CAPACITOR

- 2) Ensure your head alignment is perfect and re-check it every 3 months. (Perhaps the club could buy a few alignment tapes and hire them out?) Incidentally don't try and copy a head alignment tape. A copy is always slightly degraded from the original and could give misleading results.
- 3) Clean the heads regularly, especially if using cheap tapes. Use a cotton bud and cleaning fluid in preference to the more abrasive cassette-type head cleaners. I use my Ace every night (my divorce case comes up soon!) and I make a point of cleaning the heads every other night.
- 4) Don't buy expensive "computer quality" tapes. These often require a higher bias than the type of recorders used on most micros are capable of.
- 5) Use C10, 15, 20 or 30 cassettes. C60's may give trouble on older recorders. The more tape there is on a cassette the more drag is produced and hence the greater the risk of speed fluctuations which most micro's will not tolerate. Never, ever, use C90's. Not only is there a lot of drag on a C90 but the tape is very thin which gives rise to tape stretch and "print-through" both of which are guaranteed to produce Error 10's!
- 6) Head de-magnetisation. Two schools of thought on this one. Some say it's essential, some say it isn't necessary! As a computer engineer I can quote a number of sites that haven't had their tape systems de-magnetised in 8-9 years of daily use! However I do it periodically on the theory that it won't hurt anything and may actually help!
- 7) Finally, if all else fails try the mod quoted above. The relevant capacitor is shown in fig. 3. However, a word of warning. The printed circuit tracks on the Ace are very thin and unless you are an expert with a soldering iron will lift very easily, so if you are not an expert get someone else who is to do it for you!

HAPPY LOADING!



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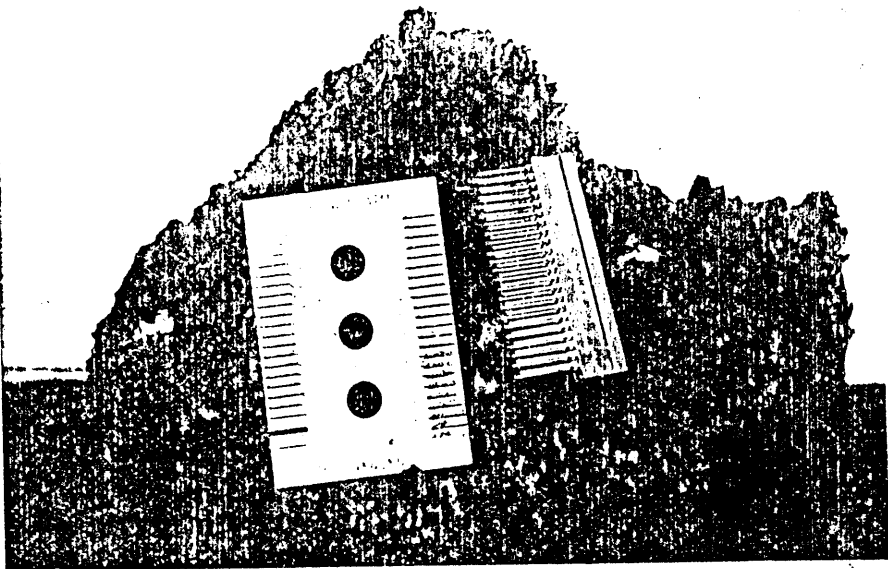
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## USEFUL ROM ROUTINES

GARRY KNIGHT

Here are some useful ROM routines gleaned from \$0 - \$ FFF:

\$ 336 - a subroutine returning the value of a keypress in the a-register

\$ 44D - performs a @ on a system variable. May be used by setting up a word, e.g. \$ 3B VARIABLE X \$ 44D FIND X !

Every time you use the word X the value contained in the system variable SPARE will be stacked.

\$ 48D - a routine that stacks the value contained in FLAGS.

\$ 4E4 - a subroutine that checks to see if the BREAK key is being pressed, performing a RET if it isn't or aborting with ERROR 3 if it is.

\$ 536 - prints OK and does a CR

\$ 68A - stacks a 0 then does a JP (IY).

\$ 84E - a subroutine that pops the byte at TOS to the BC pair using HL.

\$ 979 - a subroutine that, given a string in memory with a preceding byte-count pointed to by DE, prints it to the screen (or printer) - useful for word processing.

\$ A07 - converts a number in the range 0-15 on the stack to one hex digit. You can print hex nos. with this word:

: H. 256 /mod 2567 call 2567 call ;

Obviously this leaves BASE unchanged.

You can insert calls to FORTH words or threaded-list ROM routines by assembling a CALL \$ 4B9 then entering code-field addresses of the words or routines (LSB first) and ending either by entering \$B6 \$04 to jump back to FORTH or entering \$ 0E \$ 1A and then continue assembling machine code. Here is an example:

```
CD B9 04    call $ 4B9
B3 08       defs          ;@
6B 08       defs          ;DUP
8A 04       defs          ;BASE
C1 08       defs          ;!
0E 1A       defs          ;continue code
18 FB       jr -5
```

One feature of my latest game, ALIENS\*, is the ability of the program to detect multiple key presses. Here's how it's done. As it says on page 154 of the Ace manual, each half-row of keys corresponds to a unique Z80 port address, with the outer-most key on each row corresponding to bit 0 of the data read in from that port. The assignment of keys to ports is fairly straightforward, except on the bottom row, where SYMBOL-SHIFT has been assigned to the port for the left-hand half-row, and the 'v' key has accordingly been moved right. Fig. 1 shows the logical layout of the keys with respect to their port addresses.

So, to find out whether a particular key is being pressed you can either read the port and perform some simple logic on the number returned, or you can type in the routine listed below which does it all for you in machine code. The way you use it is as follows. Suppose you want to execute the word LEFT if the '5' key is being pressed, and execute the word FIRE if the '0' key is being pressed, no matter which other keys are being pressed at the time. Simply define a word which includes:

```
ASCII 5 READ KEY IF LEFT THEN ASCII 0 READ KEY IF FIRE THEN
```

So, to detect number keys, use the ascii code of the number for letter keys use the ascii code for the lower-case letter on the key. You can detect the ENTER, SPACE, SHIFT and SYMBOL SHIFT keys with 13, 32, ASCII C and ASCII S. Note that these last two are upper-case. READ KEY leaves a true (1) or false (0) value on the stack. If anybody would like the ZX Spectrum version of this routine please send a SAE to Garry Knight, 30A Stanton House, Thames Street, London, SE10 9DJ.

(\* Tape 15 - £5.50 to club members - JN)

-Fig.1-

4	3	2	1	0	bit layout of the keyboard.
v	b	n	m	sp	port
h	j	k	l	ent	7FFE
y	u	i	o	p	BFFE
6	7	8	9	0	DFFE
5	4	3	2	1	EFEE
t	r	e	w	q	F7FE
g	f	d	s	a	FBFE
c	x	z	SYM	SH	FDFE
					FEFE

Fig.2 the listing.

CREATE READ 48 ALLOT

: IN

48 0

DO

RETYPE NUMBER DROP READ

I + C!

LOOP

;

16 BASE C! IN

43 53 7A 78 63 61 73 64

66 67 71 77 65 72 74 31

32 33 34 35 30 39 38 37

36 70 6F 69 75 79 0D 6C

6B 6A 68 20 6D 6E 62 76

FE FD FB F7 EF DF BF 7F

(Enter from left to right, pressing ENTER after each, is 43 (ENTER) 53 (ENTER), etc)

DEFINER MC

38 (hex) 0

DO

RETYPE NUMBER DROP C,

LOOP

DOES>

CALL

;

REDEFINE IN

MC KEY

DF D5 DF E1 E5 7B 06 08

0E 05 16 01 BE 28 0B CB

22 23 0D 20 F7 10 F1 E1

E7 00 E1 3E 08 90 4F 06

00 09 01 28 00 09 46 0E

FE ED 78 2F E6 1F A2 11

00 00 28 01 13 D7 FD E9

DEFINER MC

DOES>

CALL

;

REDEFINE MC

DECIMAL

The Ace has been plagued by false rumours - mainly set up by journalists - and I've had to reassure several people on the phone as a result.

So,

NO, the Ace isn't about to have a decent keyboard. All that's happened is that the case is being made by a stronger process, mainly for the US market. In the fullness of time, said strengthened case will also be made available on Br models.

NO, a new version of the ACE with internal memory of 19K hasn't appeared. All that's happened is that Jupiter Cantab have started to market the Ace with their 16K add-on rampack to dealers at the same trade price as the Ace by itself was previously.

NO, a new MKII Ace with 64K ram is not about to appear. That's journalistic license, printer's error, or whatever.

However,

YES, Richard Altwasser has left Jupiter Cantab Ltd. Geoffrey Walker is now a co-director with Steven Vickers, and hopefully brings much needed marketing expertise to the company. What's Richard doing now? Dunno. Is he designing a new Forth micro. Dunno. Hope not, because

YES, REMSOFT is helping to design a new FORTH micro. To be manufactured and marketed by Microkey Ltd, of Brighton, this so far unnamed machine will be 6502, 128K RAM, full FORTH-79, full-travel keyboard, range of outputs on the back. DOS on board for Sony microfloppy discs (to be sold separately). Core machine will be c£400

## FORTH COLUMN.

This is being written on a Jupiter Ace with fast, full travel keyboard, using a Text Processor program at present being developed by Garry Knight. The Ace has 32K Ram and is driving a Tandy CGP-115 four-colour printer plotter via a 'home made' RS232C interface.

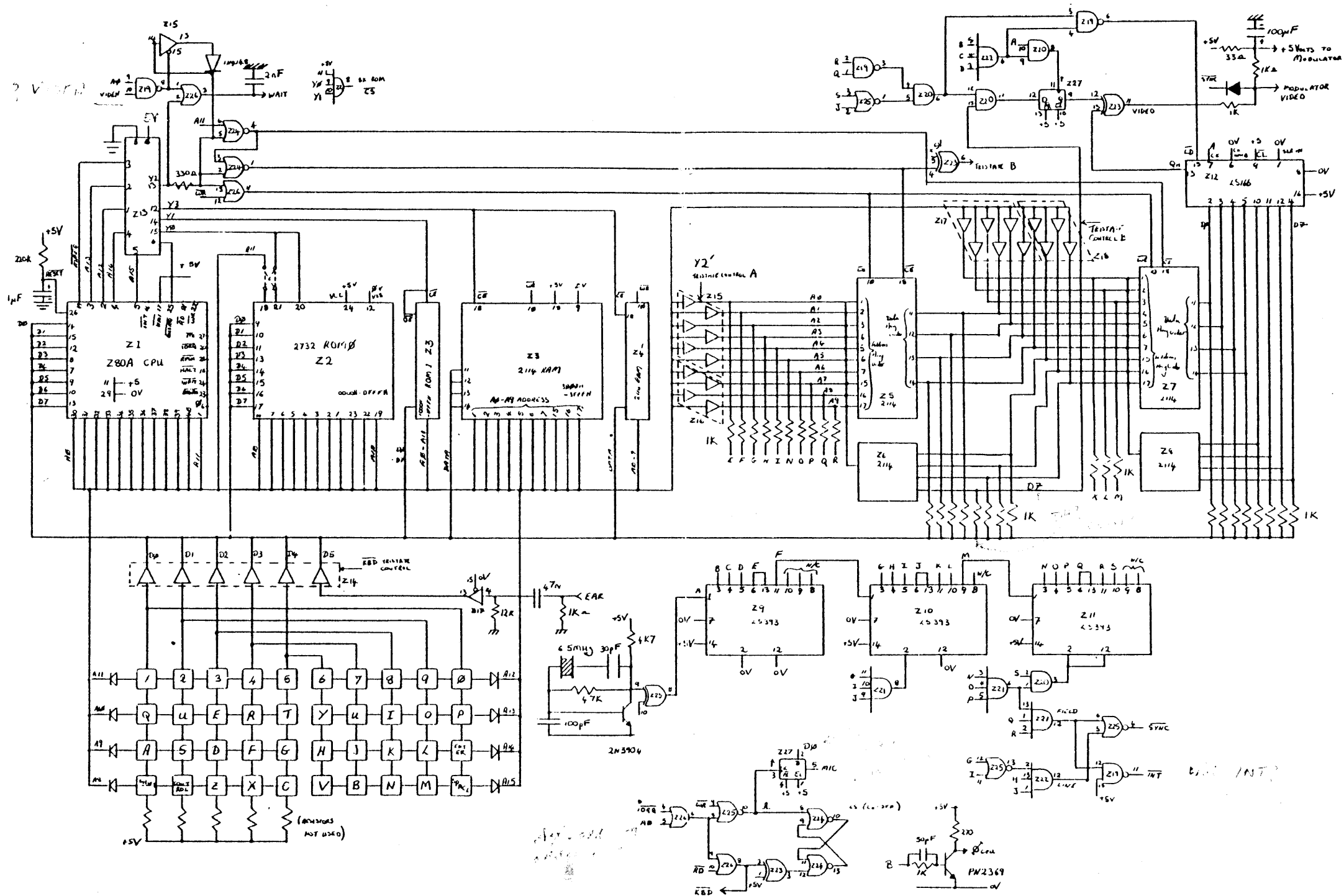
From the above, the ever patient Ace user will conclude that there have been some developments since the last newsletter. Readers have responded with some technically excellent software, and JAUC will reach Tape 30 very soon. It is apparent that many readers are also busy developing their own hardware out of sheer necessity, since the market has failed dismally to supply much needed items. True, one or two bold companies have ventured forth with in-out ports, there is a hint of a communications interface to link with Telcom Gold, and Jupiter Cantab are dropping the price of the Ace and are planning an injection moulded case.

Jupiter, ACS, CP, and others have produced software, and (wait for it!) a scattering of well known computer mags have actually reviewed some Ace software. God knows we have sent them enough tapes over the last six months to stock a lending library, while they continued to complain about a lack of Ace software!

### HINTS & TIPS.

Firstly to clear up the slight confusion over the 'Traffic Light Controller/Switch Detector in the Ace manual. They work, but are not uniquely addressed. Both respond when A1 is low, and so can be accessed by a wide range of addresses, which means they will not work in conjunction with other in/out devices such as the ZX printer, chatterboxes, and separate printerfaces.

(1) Because of the way the ports are connected (see page 15) the  
32K will not fit 1 tape.



Those who have tried ZX 32K Ram expansions on the Ace may have noticed that 15384 @ U. yields 0 OK, instead of 49152 OK. The Ace is deceived into thinking it has an extra 48K but can't find anywhere to put the return stack, so it sticks it just below 32768. The consequences are a reset if the stacks collide, and goodbye your program. When first switching on type 49152 15384 ! QUIT to let the Ace know where to put the return stack. These problems do not occur with the Pacer 32K Ram.

Now to our old favourite LOADING and SAVING. Early models of the Ace are slightly less reliable with LOAD/SAVE, but generally the Ace has a good tape port. Always use computer grade tapes, not audio tapes, and stick to one brand of tape. Audio tapes are very variable in output and quality. The Ace power supply, in common with many others, has a floating output, which means the Ace is not earthed except via its connections to other equipment. As most TV sets and tape recorders are also not earthed you may find yourself in the situation where the entire set-up has a floating earth return path; this is not necessarily a bad thing since it avoids hum loops, but you may get better SAVE recordings if you attach an earth wire to the outer braiding of your tape lead. Many tape recorders provide a monitoring output from the EAR socket while recording, if this is connected to the Ace at the same as MIC this may increase the noise level on your recordings.

You may not be aware that a simple transistor radio can be used to monitor LOADING and also act as a BEEP sound booster. It will work on VHF, MW, and LW. Type LOAD and tune your radio for a high pitched whistle. Check that the whistle is coming from the Ace with BREAK. It is best to find a section of the band without stations. When loading you will hear

staccato noise on top of the whistle then a change in pitch as the program lead-in is loaded, then comes a buzzing from the program itself. If you operate BEEP a 'muddy' but loud version will be picked up by the radio, this can be used to good effect when playing games on the Ace.

There now follows my version of CMOVE which includes zero and negative bytes checking.

Doug Bollen.

3C5D DF	RST 18
3C5E 3E 00	LD A,00
3C60 BB	CP E
3C61 20 05	JR NZ,3C68
3C63 3E 00	LD A,00
3C65 BA	CP D
3C66 28 10	JR Z,3C78
3C68 CB 7A	BIT 7,D
3C6A 20 0C	JR NZ,3C78
3C6C 42	LD B,D
3C6D 4B	LD C,E
3C6E DF	RST 18
3C6F D9	EXX
3C70 DF	RST 18
3C71 D5	PUSH DE
3C72 D9	EXX
3C73 E1	POP HL
3C74 ED B0	LDIR
3C76 FD E9	JP (IY)
3C78 E7 14	RST 20,14

This gives ERROR 20 for out of range.

## READERS' LETTERS

### SOFT KEYBEEP.

At last there is an alternative to the dreaded REDEFINE! Define the word : R REDEFINE ; and use R word instead of REDEFINE word. There is a limitation though, the word must be placed at the very start of the dictionary (or just after any non-relocatable machine code you may have loaded). If you do not do this and try to redefine a word before R in the dictionary, the redefining could move R around in memory causing the computer to crash when it tries to find the end of R after doing REDEFINE. So long as you only R a word after R in the dictionary it will work. Does anybody know where the ROM routine to reset the character set is so I can CALL (or MC equivalent) it to set any redefined characters back to normal? Also, when will ACE USER become a weekly/monthly/bi-monthly?

You had a letter from R.J.Dunham asking about a word to produce a 'BLEEF' every time a key is pressed. You replied that extra hardware would be required, this is not so. I have written a machine code routine to produce the bleep which does not interfere with any of the normal ACE running except that it still bleeps if you press a key while the ACE is 'thinking' (ORIC style). The routine will fit in 1K and there is room inside the program for machine code data from 3CD8 to 3D1E due to the way the ACE works. I will send it on a decent tape to anyone who sends me £5.00 along with a '19K-ACE-needed' type of hex monitor which can do all sorts of things your average hex monitor can't and contains machine code CMOVE and FILL which can be used in other programs by FORGETTING the rest. All programs are well documented. Money to Colin Dooley, 37 The Avenue, Fairfield, Stockton, Cleveland TS19 7EP.  
p.s. There is a bug in your 'Frogger'. Try crossing the road at the side of the screen - you can ignore the cars !

Points noted. ACE USER will become a daily when enough people buy ACEs and join the User Club. Remsoft will be selling a keybeep tape with different key-tones shortly.

Doug.

### INVERSE TRIG & ACE CIRCUIT.

Thank you for Newsletter No. 2 which arrived yesterday full of useful information. It prompted me to raise the following two queries which I hope you can answer.

- 1) How do I get the Ace to do inverse trig. functions (arcsin, arcos, arctan)?
- 2) Is it possible to get a circuit diagram for the Ace similar to that with the ZX81 Kits?

David Atkins, Rickmansworth.

Answers: 1) Define your own trig. words or buy Tape 21.

- 2) See centre pages. Our thanks to Jupiter Cantab for sending a copy. Further copies can be from them for an SAE.

Doug.

16 BIT IN/OUT.

10 1.  
6  
I received your 'Ace User' NO.2 today, and I must say I was pleasantly surprised at the amount of useful information in it. I should like to correct your statement that the IN and OUT commands use single byte addressing. The Z80 has a full 16 bit address space for its I/O ports (there is widespread confusion over this because of the way the assembler mnemonics are defined, but it is true) and IN and OUT put all 16 bits from the top of the stack on the address bus. If you doubt this, you can prove it by using IN to read the keyboard row by row (see p. 154 of the manual).

Steven Vickers, Cambridge.

I stand corrected once again! Doug.

CHARACTER SET IN RAM.

Thanks for replying to my letters but... my hi(ish) res program needed to use the Chr\$ set memory as data storage so the Chr\$ set in ROM is useless. So how does the Ace read this memory correctly?

As to listings in the magazines, my Alien Swarm (p28 of Newsletter No. 2) is a simple space invaders but as soon as I get a 16K pack I will improve it no end and send it off to you. The music program is pretty trivial (although it gives an example of 'definer' which may be useful). There is also an error in the scale example

```
:SC (definition here) SC;
```

so the word calls itself and carries on forever? - well not quite. The memory fills up with return addresses so a corrected version is;

```
: SC (definition) R> DROP SC ;
```

which saves two bytes on a Begin - Until loop.

Please tell people not to follow the example (in PCW) of writing a game with one word (this game works but after about five minutes play you can get infinite scores so it gets slightly dull) because if you make just one mistake, either the word is ignored or if it doesn't work there is no room to edit it. Very silly.

There is a version of PACMAN in 'Your Computer' March '83 for the Ace which is quite good but I don't expect many people have got it to work. For a start, save the screen picture at the beginning or when the Ace is empty (otherwise you lose it) and unfortunately large numbers of comments are placed inside word definitions without brackets - so it is very easy to get muddled up.

Martyn Sudworth, Bristol.

Can any reader solve the problem of reading the character set in RAM? Is it OK'd with the Ascii code? I suspect that typesetters have problems with Forth because the language depends on spaces and punctuation marks. However, thanks for the information and let us hope that the listings in the magazines will improve.

Doug.

# TRADE DESCRIPTION AND SOFT EXPLANATIONS.

Could you please tell me if there are any differences in architecture between the Z80A and the NEC D780C-1 as my machine contains the latter? I understand Zilog are about to sue Nippon Electric for infringing Zilog's patents in the series. Are Jupiter Cantab justified in advertising these machines as Z80A controlled? Could you please recommend a good machine code book. What advantages do the tapes PEEKER and TOOLKIT have over the word READ in Newsletter 2? In fact, I think that many of your utility programs would benefit from more explanation. E.g. PICASSO what resolution? STRINGS, does the cassette contain a binary search? What advantages does the CHARACTER designing program have over an altered GR (i.e. address changed to 9211 then saved from 9220) etc. Also will there be some information on how to fit a fullsize keyboard to the Ace in the Newsletter 3? Just a suggestion, Personal Computer World (June) contained a review of some software for ORIC 1 and Jupiter Ace (3K). Might it be worth your while to send a free selection to magazines, and are all the differences from std Z80A M/C contained in Newsletter 2?

D. Tomlinson, Wakefield.

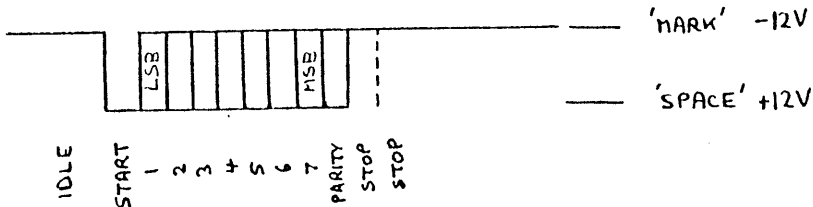
Whew! I think I will chicken out of this reply and throw it open to you readers and software authors.

Doug.

For the uninitiated the RS232C interface is a method of communicating with other devices such as printers, modems, etc. with a serial bit stream down one wire. The other standard communications link is the Centronics one (only with printers) which is 8 bits in parallel. Most printers are fitted with either one or the other although some are non-standard (ZX81 printer). Adaptors can usually be fitted to printers to connect one to the other.

The interface unit to be described is a simple RS232C interface designed to work with the Amber 2400 printer although it will work with other RS232C compatible printers. The RS232C standard defines the voltage and current levels to exist between the transmitter and the receiver and the names of all the wires and the pin numbers on the standard connector. The full link uses 25 pins but the number used depends on how intelligent the devices are. However the protocol used (the formatting of the bit stream) is definitely not standard although the higher priced printers are switchable to take what is given.

The protocol we are going to use is fairly standard: Start bit, 7 bits of data, parity bit and 2 stop bits.



The routine to drive an output port with this stream is done in machine code. The timing of all the pulses must be precise as this defines the BAUD rate and must be set at one of the standard levels. Obviously the printer must respond at the Baud rate selected.

Using 9600 baud the length of each pulse must be 104µs. So one line of 24 characters can be transmitted in about 30ms. It will take about 1 second to print this out. This data transfer rate corresponds to 850 characters per second.

#### MACHINE CODE

In machine code, the precise time, 104µs, can be achieved by going round a loop a number of times provided it is uninterrupted by anything else. The other parts of the code we have to do are to work out the parity, then output the bit stream using the time delay loop. After outputting a character we can return to FORTH to get the next character. It is necessary to drive the port with the complement of the bit pattern using the design of hardware used. The flow diagram shows the method of achieving the output.

# TIME DELAY SUBROUTINE

SET LOOP COUNT TO 18

DECREMENT COUNT

JUMP IF NOT ZERO

RETURN

## ROUTINE CH (OUTPUT A CHARACTER)

DISABLE INTERRUPT

TRANSFER CHARACTER  
FROM FORTH STACK

WORK OUT PARITY AND  
ALTER BIT 7

COMPLEMENT WORD

OUTPUT START BIT & TIME DELAY

SET CARRY TO ZERO

OUTPUT REGISTER & TIME DELAY

ROTATE RIGHT

DO 9 TIMES

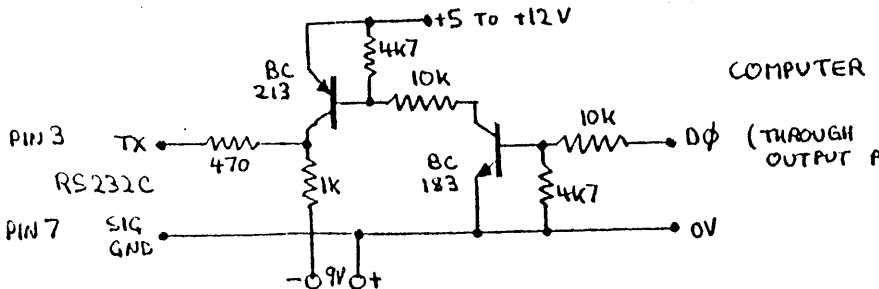
ENABLE INTERRUPT

RETURN TO FORTH

The machine code (see listing) must be entered starting at address 15456 and suitable Forth words to do this were given in the last issue.

## HARDWARE

Assuming you have an output port at address 0001 H (circuit diagram in last issue) then the circuit given, attached to D0 will work. The RS232C levels require a transmitter voltage of +12V for a space and -12V for a mark. The receivers must cope with a minimum voltage swing of +3V to -3V. So we can safely drive our interface with +5V supplies as we are not bothered by long leads.



The negative line can be defined using a 9V PP3 battery connecting the +ve terminal to 0V and the -ve terminal supplying the negative rail. It is wise to only connect in the battery when you are ready to print to preserve its life. The 470Ω resistor in the serial data out, determines the short-circuit current which must be less than 20mA.

With no other connections used, the ACE must do a time delay to allow the printer to do its stuff before outputting the next line of characters. We can use the BUSY line from the printer going to an input port but that just adds further complexity.

15456 3C60 D3 01 OUT (01),A  
 3C62 2E 12 LD L,12  
 3C64 2D DEC L  
 3C65 20 FD JR NZ,3C64  
 3C67 C9 RET  
 15464 3C68 F3 DI  
 3C69 DF RST 18 H  
 3C6A 7B LD A,E  
 3C6B E6 7F AND 7F  
 3C6D E2 72 3C JP P0,3C72  
 3C70 F6 80 OR 80  
 3C72 2F CPL  
 3C73 4F LD C,A  
 3C74 06 09 LD B,09  
 3C76 3E 01 LD A,01  
 3C78 CD 60 3C CALL 3C60  
 3C7B 79 LD A,C  
 3C7C A7 AND A  
 3C7D CD 60 3C CALL 3C60  
 3C80 1F RRA  
 3C81 10 FA DJNZ 3C7D  
 3C83 FB EI  
 3C84 FD E9 JP (1Y)

I have chosen to output the characters by copying them from the screen RAM because all the data locations contain ASCII characters. A lot of work has been done by the ACE to produce this format so we do not want to waste it.

These simple words will output just the first 24 characters on each line on the screen. It will also print 20 lines. You could rearrange it slightly to print nothing if the whole line is blank.

## WORDS TO DUMP A SCREEN

```
; CH                               Enter with a character
      15464 CALL
;

: SOLN      (address - end address)  Copy a screen line
                                         to printer
      DUP 24 + LUF ROT
      DO
      I C= CH                          Get 24 characters and
                                         output to printer then
      LOOP                                output carriage return
      13 CH
;

: SCREEN!                                         Start address of
                                         screen
      9216 20 0
      DO
      SOLN 3 + 20000 0                    1½ sec time delay
      DO
      LOOP
      LOOP
;
```

To use this you go to INVIS mode and LIST the words on the screen that you want then type SCREEN and your screen will be dumped. If you are using graphics the printer will not respond properly because these routines are just for characters. CH can also be used in a programme when you want to print out results of calculations but you will have to convert the numbers to individual ASCII characters.

BOOKS

WINFIELD, Alan. The complete Forth. Sigma, 1983.

The first general book on Forth written and published in Britain. Excellent - and a reasonable price too.

VICKERS, Penny. The Forth bridge: translating BASIC into FORTH. Jupiter Cantab, 1983. no price stated (21 pages).

A curious pamphlet this. A tabular comparison of Basic words and their FORTH equivalents. In my view, the two languages are so different, that comparisons of specific words are pointless. However, some of you might find it useful. If you want a copy, give Jupiter a ring on 0223-313479.

PERIODICALS

Since the last Biblioforth, the number of magazine articles on Forth has mushroomed. What follows are some general articles, and all the Aceforth articles I could find.

FORTH INTEREST GROUP(UK)

I now have a set of their FORTHWRITE newsletter. Its pretty rough and ready, but some useful ideas are buried. Contents include:

## Volume 1 (1981):

Dick Harrison. Target compiler  
 Bill Powell. FORTH without @  
 Steven Ardron. Multiple arrays  
 Bill Stoddart. FIG-FORTH Z80 assembler  
 Roger Cuthbert. 6502 Forth assembler  
 K.C. Goldie-Morrison. (several listings in Stoic, a Forth-like language)

A 'TINY' pseudo-code for FORTH  
 G.David Green. Fast array definition for fig-FORTH  
 Bill Stoddart. Forth terminal log facility.  
 Gil Filbey. Floating point for Apple  
 Bill Stoddart. Integer sine and cosine routines  
 The calculation of a square root in binary (in 8080 Forth)

Vol.2 no.1: Mark Perkel & Bill Stoddart. Local variables  
 Dick Harrison. Fast Fourier transform  
 Gil Filbey. Floating point for Apple  
 Vol.2 no.2: Bill Powell & Ben Linstead, Ski game (UK101 forth)  
 Vol.2 no.3: Satyam MITRA. CASE statement  
 P.J. Oakley. Queens solution (chess)  
 G.David Green. Random numbers  
 A.Williams. A newcomer's look at Forth (Rockwell Aim-65)  
 Vol.2 no.4: Gil Filbey. Typing (simple word processor for Apple and Epson 80/FT printer)  
 Vol.2 no.5: Bill Stoddart. Vocabulary notes  
 Use of EXIT for a case structure  
 Gil Filbey. FIG Database (program for holding FIG UK membership addresses + data)

Vol.3 (no.1?): Gil Filbey. Out of sorts  
 Frank Dale. Using machine code in Forth (6809 using FLEX)  
 Ted Forsyth. HIDE and SEEK for beginners (holding multiple versions of the same word)  
 J.W.Brown. A Turtle graphics(LOGO) extension to FORTH (on BBC)

R.W.Macmillan reminds me of the following in PERSONAL  
COMPUTER WORLD:

CURTIS, M. Go FORTH and multiply. PCW vol.4 no.12, Dec 81:  
126-131

"A good introduction to FORTH"(R.W.M.)

CURTIS, M. Jupiter Ace benchtest. PCW vo.6 no.1, Jan 83:  
128-131

OLNEY, R. IBM comes FORTH. PCW. Vo.6 no.7, July 83: 198-204

Alan Sartori-Angus. Cosmic conquest. BYTE vol.7 no.12,  
Dec 82: 124, 126, 128, 130, 132, 134, 136, 138,

This space game won first place in Byte's Game Contest.  
Written in Forth for the Apple. Anyone tried this on the  
Ace yet?

Joel McCormack & Richard Gleaves. Modula-2: a worthy  
successor to Pascal. Niklaus-Wirth, creator of Pascal,  
now brings us a general-purpose systems-implementation  
language based on modules. BYTE vol.8 no.4, April 83:  
385-395

The modular approach is something that newcomers to FORTH  
often forget. This article will set you thinking.

Victor Joseph Grazi. Add high-level logical structure to  
your FORTH assembler. BYTE vol.8 no.7, July 83: 484,486,488,  
490-492

Written for 8080, but of use to other Forths according to  
the Byte editor.

D.S.Peckett. Going Forth again. COMPUTING TODAY May 83:  
45-48

Follow up to his series last year (see BiblioForth in Ace  
User no.2).

Owen Bishop. Forth comes home. COMPUTING TODAY May 83:53-56  
Review of the Ace and AceForth.

D.S.Peckett. Going Forth again (Pt 2). COMPUTING TODAY  
July 83: 37-40

Useful survey of the various Forths available in the UK.

Nigel Freestone. Jupiter Ace Review. ELECTRONICS & COMPUTING  
MONTHLY vol.2 no.11, November 82: 70-71

Another of the pre-production reviews.

Ralph Hilton. Jupiter Ace electronic scrambler. ELECTRONICS  
& COMPUTER MONTHLY vol.3 no.5, May 83: 42-43

Club member Ralph Hilton looks at ways of scrambling data  
that can only be unscrambled by a specific codeword. Interesting.

Ps. The two articles from E&CM in last BiblioForth should read  
vol.2 - E&CM got it wrong, and I, being in a hurry, didn't check..

HOME COMPUTING WEEKLY actually has a reviewer (G.M.) who is  
knowledgeable about the Ace, and does hard hitting reviews:  
Review of our Tape 4, HCW May 31, 1983: 34 ("value for money 90%")  
Review of our Tape 6(Toolkit/Screenkit). HCW June 7, 1983:25  
("excellent utilities ... value for money 90%")

Hi-Tech's Invaders. HCW June 28, 1983: 11 ("feeble version...  
value for money 5%")

Review of Jupiter Cantab's Monitor: HCW July 12, 1983:29  
("provides less information than the Remsoft toolkit" ... value  
for money 65%)

CONTINUED NEXT ISSUE.... CONTINUED NEXT ISSUE... CONTINUED NEXT

Congratulations to ACS for being among the first to market serious software for the Jupiter Ace. Their assembler and disassembler packages are nicely presented and well documented.

CALLISTO is a two-pass assembler with its own editor. The assembler sits above ramtop address 25996 and the editor is contained in dictionary up to 17009. Source code goes into 17100 onwards. Lower case Zilog mnemonics (as they appear in Appendix A of the Ace manual) are used and real labels of any length are permitted. Facilities include separate loading and saving of source code, number entry in decimal or hex, use of Ace normal editing keys, and useful pseudo instructions and error messages. Code can be compiled to run at a location other than where it is stored, and can be relocated easily with BLOAD.

Unfortunately, the editor in dictionary is software protected and you can't VLIST, LIST or assemble straight into a parameter field. With no access to dictionary this feels a bit like flying blind. Why do assemblers always monopolise those areas of memory most likely to be needed for storing machine code? Never mind, Callisto is a thoroughly good program! Recommended.

After Callisto, the GANYMEDE disassembler is a bit of an anti-climax. Decimal start addresses only, no FIND YOURWORD addressing, and no back scroll. Forward scroll is quite fast though, which makes it easy to zip upwards in memory, and it is possible to VLIST and LIST with this program. Options included are start, continue, restart, and exit. Ganymede reserves about 6K above ramtop at 26589 and uses only 306 bytes of dictionary. Mnemonics are accompanied by decimal numbers and bytes are listed in hex. Doug Bollen.

CALLISTO £7.50 GANYMEDE £6.75 both inc. VAT and postage, from;

ACS Software,  
7 Lidgett Crescent,  
Leeds LS8 1HN.

## CROCODILE TEARS DEPT

Micro Marketing, the London-based firm that originally whole-saled the Ace, has gone bust, and left their premises rather quickly... Their range of software was terrible. It's still being hawked around, so don't buy it, even if it is being sold off cheap. Still at least Micro Marketing nudged Stonechip into producing the Pacer add-on rams. But a software distribution firm that didn't even know how to load its own tapes? (and didn't even have a TV in the office half the time, either). They won't be missed.

Ili-Tech of Kent have what, by all accounts, is a better range of Ace tapes, though the only review we've seen was terrible.

There's also a chess program out, which we were offered on trade terms which were rather high, but no copy to review, so no idea of its potential. The programmer had a high regard for himself when he approached us at the last ZX Microfair... (JW)

**TAPE 11: ZX PRINTER DRIVER****JOHN WIKE**

305 bytes mainly machine code. Diverts characters from screen to printer. Full character set including lower-case, inverse and graphics. No redefined characters. Needs simple ACE/ZX adaptor, but no other hardware. Runs from existing ACE power pack.

CLUB PRICE:£5.50; OTHERS: £6.50

**TAPE 12: FIVE COMPACT GAMES (3K)****GARETH RICHARDS**

Frogger, Scramble, Meteor, Breakout, Star Wars. Slow or fast mode. Very good value!

CLUB PRICE:£5.50; OTHERS: £6.50

**TAPE 13: ACE ASSEMBLER (3.9K)****GARRY KNIGHT**

Complete Forth assembler with Z80-like mnemonics, 20 labels, subroutine calls, source/object code save, macro-assembly, hex dump, etc. Assembled words may be used in Forth definitions.

CLUB PRICE:£6.50; OTHERS: £7.50

**TAPE 14: EQUATIONS (19K)****RE LIDDIARD**

Equations with hi-res graph plot. High resolution graph plot of equations, with automatic scaling. Comprehensive dictionary of floating point operators, trigonometrical and exponential functions. 10 examples included in dictionary.

CLUB PRICE: £6.50; OTHERS: £7.50

**TAPE 15: ALIENS (19K)****GARRY KNIGHT**

Laser-happy, shoot-em-up space game. 10 levels of aliens each with its own characteristic movement and behaviour pattern, with level 10 in a tricky maze. Saturation bombing. Up to 100 aliens on screen. Hi-score, hold game, multiple key-press. CLUB PRICE:£5.50; OTHERS: £6.50

**TAPE 16: GRAPHIC GOLF (19K)****GR YORKE**

1 or 2 players. 1 or more holes in course. Bunkers, water, rough, trees, random slice, etc. Hole number, distance, par, and shots count, all on display. Includes sound.

CLUB PRICE:£5.50; OTHERS: £6.50

**TAPE 17: DISSASSEMBLER (5.8K)****M.FINLEY**

Zilog like mnemonics, forth assembler syntax, forth assembler control structures. Hex only. 16 run-on instructions. Jump destinations instead of offsets. Optional customising. CLUB PRICE:£6.50; OTHERS: £7.50

**TAPE 18: PROTECTOR (530 BYTES)****A.CRANSTON**

Disables LIST, VLIST and SAVE. Uses code word for SAVE. Displays "This software is protected" with error code. Can you crack the test program?

CLUB PRICE:£5.50; OTHERS: £6.50

REMSOFT  
Computer software  
18 GEORGE STREET  
BRIGHTON BN2 1AH  
tel: (0273) 602354

TAPE 19: PRINTERFACE (400 BYTES + 1300 BYTES  
VERSION) DOUG BOLLEN

Details of simple RS232 interface for ACE which connects to 'Traffic light' or other in-out ports. Adaptable software on tape to run Tandy CGP-115 printer/plotter with full facilities, including + or - 999 by 480 plot resolution, printing from screen, definer string, dot quotes or stack. Four colours, 63 character sizes and corresponding line lengths, all software controlled. Will not print ACE inverse or graphic set, only ASCII 33-127 plus control codes. Tape + booklet CLUB PRICE:£8.50; OTHERS: £9.50

TAPE 20: SUPERSTRINGS (3.7k) GARRY KNIGHT

Advanced string-handling package which may also be used for games and to set up a data-handling program. 67 string handling words combine FORTH and machine code to allow the use of 'long' strings and arrays. Tape + booklet CLUB PRICE:£7.50; OTHERS: £8.50

TAPE 21: MATHS/TRIG FUNCTIONS (1.5k) ALAN WATSON

Based on Chebyshev p ynomials. Exp, in, powers, sqr, arctan, arcsin, and arcos fully floating point. Sin, cos, tan, and cot integer arguments, FP result. Other functions may be derived quite easily. Comprehensive documentation with listings. CLUB PRICE:£7.50; OTHERS: £8.50

TAPE 22: JUNIOR ACE MATHS(6K) KEITH WARD

Entertaining program to help you with maths. Examples of add, subtract, multiply, divide, and missing numbers in a series. Sound and graphics. Ideal for under 12s. CLUB PRICE:£4.50; OTHERS: £5.50

TAPE 23: COMPACT DISASSEMBLER (844 BYTES) AND HEADER  
SCAN (448 BYTES) PJ SMITH

Displays grouped operational codes in any number base (in Rom (3K Ace) or Ram (expanded Ace)) and details of Forth headers in Rom and Ram. CLUB PRICE:£5.50; OTHERS: £5.50

TAPE 24: SOFTWARE KEYBEEP (224 BYTES AND 768 BYTES)  
LEX VAN SONDEREN

Sits above ramtop and gives a low tone for keys ASCII 33-44, medium tone for ASCII 65-127, and a high tone for ASCII 0-32. CLUB PRICE:£5.50; OTHERS: £6.50

## The Jupiter Ace: A Forth Computer

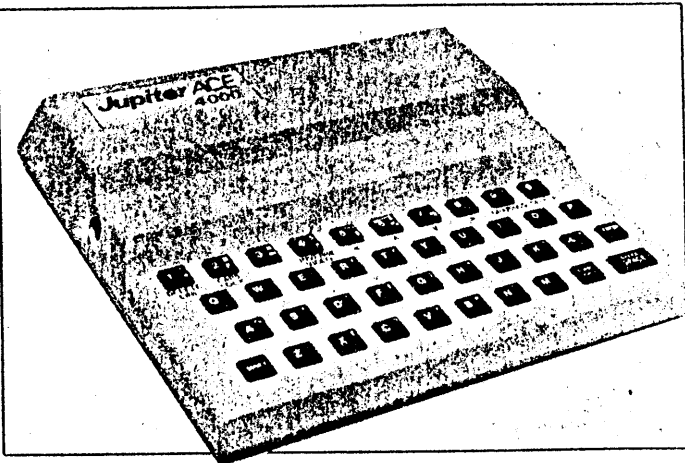
No matter how you look at it, the Jupiter Ace, manufactured by Jupiter Contab Limited, is a small machine. Measuring  $8\frac{1}{2}$ " by  $7\frac{1}{2}$ " by  $1\frac{1}{2}$ ", it is slightly larger than the Timex Sinclair. The price is also small. The machine is available by mail order for \$150 from Computer Distribution Associates of Oxford, PA.

The most interesting thing about the Ace is that it comes with the Forth programming language in ROM. This means that when you turn the machine on, Forth, not Basic, is running. Because there is not much software currently available to run on this machine, those who buy it are buying an opportunity to learn to program in Forth, one of the up and coming microcomputer languages. A selection of games and programming tools is promised in the near future should you yearn for other diversions once Forth is mastered.

### The Keyboard

Almost half of the surface of the Jupiter Ace is covered by its keyboard. The keyboard consists of sculpted rubber keys under which lies a flat keyboard. It is much easier to type on than the flat plastic membrane on the Timex and the Atari 400. That is not to say that it rivals the keyboard of a typewriter—the keys rock a little bit while you are typing.

The space bar has become just another small key beneath the enter key, and a special symbol shift key is used to access punctuation. Overall, the keyboard has a



### Christopher Helck

nice feel, although those accustomed to full-sized keyboards will find it a bit cramped.

The computer itself is housed in a stylish white plastic case with red racing stripes and is a breeze to set up. It comes with an American plug adapter, a video cable with an RF modulator and two lines for hook-up to a cassette recorder. An ON/OFF switch would be a welcome addition. At the present time, to shut the machine off you must pull the plug.

The Ace is built around a Z80 microprocessor. It comes with 8K of ROM and 3K of RAM, expandable to 53K. The manufacturer promises to

make 16K and 48K memory expansion modules available soon for \$50 and \$125 respectively. There are two card slots on the back. One is the Z80 pinout and the other is an edge connector that will support the memory expansion packs and an RS-232C interface when they become available.

The Ace is designed to be hooked up to a cassette recorder. A printer can also be added. The writers of the manual seem to be encouraging adventurous hardware designers to let their imaginations run wild and build exciting new peripherals. There is an example in the manual of how to hook up a traffic light controller. A built-in speaker allows beeps and even musical tones to be played.

Christopher J. Helck, Children's Computer Workshop, 1 Lincoln Plaza, New York, NY 10023.